CANNING OF OIL SARDINE *(SARDINELLA LONGICEPS)* — NATURAL PACK

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A simple and economic process for canning of oil sardine *(Sardinella longiceps)* in its own juice having very good organoleptic characteristics has been developed. The process consists in dipping eviscerated, scaled and cleaned fish in brine containing potash alum and citric acid, packing in cans, exhausting and seaming without addition of any filling medium and heat processing.

INTRODUCTION

Commercial canning of oil sardine is of relatively recent origin in India even though processes have been evolved for canning this fish in oil. (Anon, 1964; Madhavan, Balachandran and Choudhuri, 1970; Sen and Revankar, 1971) and quality specifications laid down by Indian Standards Institution (1963).

Although sardine caught in India is believed to be the cheapest in the world we have so far failed in establishing world market for canned sardine especially when there exists a very large market for this commodity particularly in the U. S. A., France etc. Sardine canned at present in India is almost entirely used by Defence forces with a very small portion being sold in the internal market.

Table I provides an account of canned sardine imported by overseas countries.

TABLE I

IMPORT OF CANNED SARDINE BY OVERSEAS COUNTRIES

(Year Book of Fishery Statistics, Fishery Commodities, FAO, 1968 to 1970)

Country	Import in tons		
	1968	1969	1970
U.S.A.	14,700	22,500	18,500
France	14,300	13,900	14,600
Italy	1,100	3,300	1,200
West Germany	7,400	9,200	6,600
U. K.	20,800	24,800	*8,800
Australia	4,800	5,100	4,700

*This figure does not include import from South Africa.

Most of these countries import this to fill the gap between the domestic production and the internal demand.

One of the major reasons why India

TABLE II
DETAIL OF THE DIP TREATMENTS

Concentration of brine, w/v	Concentration of Potash alum, w/v	Concentration of citric acid, w/v	Period of dip treatments		
15%	0.0%	0.0%	15 mts.	20 mts.	25 mts.
15%	0.5%	0.5%	,,	,,	,,
15%	1.0%	1.0%	,,	,,	,,
15%	2.0%	2.0%	,,	,,	,,
20%	1.0%	1.0%	,,	,,	,,

could not compete in the world market is high cost of production resulting from the high cost of tin plate imported for making the cans and secondly the high cost of oil used as packing medium. A great deal of work has been carried out at the Central Institute of Fisheries Technology with a view to reducing the cost of production by suitably modifying the packing medium and simplifying the technology involved, the most important outcome of which is development of a method of canning sardine in its own juice, the natural pack, which saves the cost of oil and a lot of labour. The process is discussed in this paper.

MATERIALS AND METHODS.

Oil sardine landed by country fishing crafts operated off Cochin were utilized for the study. The landed fish, while still in rigor, was transported in ice to the laboratory and used for experiments without further delay. Fish after dressing, scaling etc. were thoroughly washed in potable water till free of dirt, blood etc. and then dipped in brine of different concentrations containing different concentrations of potassium aluminium sulphate (potash alum) and citric acid, drained well, packed in quarter dingly cans in quantities sufficient to give a net weight of 106 g., exhausted in steam in an exhaust box, seamed and heat processed in retort.

Refined salt, food grade potash alum and citric acid were used for the experiments.

Moisture, total nitrogen (TN) and fat were estimated according to the A.O.A.C. (1955) method, non protein nitrogen (NPN) by the method of Bate Smith, Macara and sharp (1944) and α-amino nitrogen by the method of Pope and Stevens (1939).

RESULTS AND DISCUSSION

Fish used in all experiments were of uniform quality as regards size and chemical composition, the average figures being:

Length	12-14 cm.
Average weight	35 g.
,, moisture	68%
,, Fat	8.16%
,, TN	3.028/100 g.
,, NPN	339.9 mg/100 g.
α - amino nitrogen	52.52 mg./100 g.

Optimum concentrations of brine, citric acid and potash alum and the dipping

TABLE III

ORGANOLEPTIC CHARACTERISTICS OF THE PRODUCTS OBTAINED AFTER DIFFERENT TREATMENTS

Treating solution	Treatment time	Taste	Texture	Flavour	Nature of juice
15% brine alone	15 mts.	Salt slightly less	Very soft and disintegrated	Good	Very turbid and discoloured
	20 ,,	Salt sufficient	,,	,,	,,
	25 ,,	Salt more	,,	,,	,,
15% brine containing 0.5% each of potash alum and citric acid	15 mts.	Salt slightly less	soft and disintegrated	Good	Turbid
	20 ,,	Salt sufficient	,,	,,	,,
	25 ,,	Salt more	,,	,,	,,
15% brine containing 1% each of potash alum and citric acid	15 mts.	Salt slightly less	Firm	Satisfactory	Slightly turbid
	20 ,,	Salt sufficient, no bitter taste	,,	,,	Less turbid
	25 ,,	Salt more, slight bitter taste.	,,	,,	Less turbid
15% brine containing 2% each of potash alum and citric acid	15 mts.	Salt slightly less, bitter taste	Firm	Satisfactory	Clear
	20 ,,	Salt sufficient, bitter taste more	,,	,,	,,
	25 ,,	Salt more, bitter taste still more	,,	,,	,,
20% brine containing 1% each of potash alum and citric acid	15 mts.	Salt sufficient	Firm	Satisfactory	Slightly turbid
	20 ,,	Salt slightly excess	,,	,,	Clear
	25 ,,	Salt more, slight bitter taste	,,	,,	,,

time were determined by dipping the fish in solutions of the mixtures of the above in varying proportions, for varying periods. The details are given in Table II.

Cans prepared out of sardine have to be heat processed to such an extent that the bones also become soft. Experiment conducted to determine the heat processing time and steam pressure required showed that in order to provide the desirable characteristics as regards the texture, particularly the softness of bone to the required level, a period of 45 minitues heat processing at 1 kg./sq. cm. (120°C) steam is optimum. Hence the cans prepared with material treated as described in Table II were heat processed for 45 minutes under 1 kg./sq. cm. (120°C) steam. Cans prepared as above were tested for their organoleptic properties and the results are tabulated in Table III.

When sardine is canned after treatment with brine alone, the self juice formed inside the can becomes turbid and discoloured. Besides, on sufficient heat processing to render the bones soft the flesh becomes very soft and disintegrated. Alum helps in providing the flesh a firm texture while leaving the self juice clear owing perhaps to its sedimentation action due to which the colloidal and dispersed solid particles (in the self juice) get sedimented during the process of brining itself and thus do not pass into the cans. However, treatment with alum alone along with brine imparts a slight bitter taste to the fish. In order to overcome this a mixture of alum and citric acid is used. Citric acid, by lowering the pH of the fish muscle, imparts a slight firmness to the flesh; and a combination of citric acid and alum imparts a most desireble texture to the flesh with good taste and appearance.

It has been observed that two different treatments *viz.* (i) with 15% brine containing 1% each of alum and citric acid for 20 minutes and (ii) with 20% brine containing 1% each of alum and citric acid for 15 minutes yield products of equally good and similar characteristics. However, for sardine with very high fat content the former treatment has been found to be better as the chances for salt induced rancidity of the body fat can be minimised. Semi-commercial trials for manufacture of sardine cans have yielded products of consistently good quality.

Natural pack method effects a greater economy in the production, side by side yielding better product retaining the natural taste of sardine. Costs of production of sardine for natural pack and conventional oil pack (refined ground nut oil) in quarter dingly cans with a net weight of 106 g. are Rs. 0.78 and Rs. 1.03 respectively, for a can.

In the conventional oil pack method, sardine after brining is subjected to precooking in steam to remove as much water as possible to prevent the 'cook-drip' in the oil. This step is altogether avoided in the present method thereby saving labour, steam and time. Further, in the conventional method, oil (refined ground nut, olive or soy) is used as the packing medium which is avoided in the natural pack method. Thus, there occures saving under two important heads and hence the economy of the method.

Analysis of the finished products from the two different sets of experiments, the end products of which were found to be

TABLE IV

CHEMICAL CHARACTERISTICS OF THE FINISHED PRODUCTS FROM TWO DIFFERENT TREATMENTS

Details of treatment	Moisture	Salt	Fat	Protein (T.N.×6.25)	NPN	α-amino N
15% brine containing 1% each of potash alum and citric acid for 20 minutes	62.5%	3.15%	7.575%	24.375%	0.2450%	0.0260%
20% brine containing 1% each of potash alum and citric acid for 15 minutes	61.25%	3.35%	7.98%	24.53%	0.2195%	0.0250%

identical with respect to quality, are given in Table IV.

SUMMARY

A process for canning oil sardine in its own juice, natural pack, is described. Method consists in dipping the gutted,scaled and cleaned fish in 15% brine containing 1% each of alum and citric acid for 20 minutes or alternately in 20% brine containing 1% each of alum and citric acid for 15 minutes, then packing directly in cans, exhausting and seaming without addition of any filling medium and heat processing for 45 minutes under 1 kg./sq. cm. steam (120°C). Precooking of the brined material in conventional oil packs and the packing medium, the costly oil, are avoided and hence the economy of the process.

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